Topology-based image analysis with discrete gradients

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The need to analyze images is pervasive across scientific disciplines. While topology provides a formalism for describing and reasoning about phenomena, the practical application of this analysis has posed computational challenges. This talk motivates using discrete Morse theory as a computational tool for analyzing scalar fields, focusing on the relationship between the discrete gradient and scalar field topology. We will discuss application to real-world analysis challenges, using examples from material science, seismic interpretation, and neuroscience.